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DR. J. FRANK DANIEL, late at Johns Hopkins University, now working at the Pasteur Institute at Lille, France, has been appointed instructor in zoology at the University of Michigan, to succeed Dr. Dana B. Casteel.

DR. EMIL BOSE, of Danzig, has been appointed professor of physics in the University of La Plata.

PROFESSOR J. BAUSCHINGER has been appointed to succeed Professor E. Becker as professor of astronomy and director of the university observatory at Strassburg.

DR. EINAR HERTZSPRUNG, of Copenhagen, has been appointed associate professor of astronomy and astrophysics at Göttingen.

DISCUSSION AND CORRESPONDENCE

INDUSTRIAL FELLOWSHIPS

THE incidental reference made by Professor Kipping in his address before the British Association to a scheme of industrial fellowships which I have initiated in this university has led to so many inquiries from industrial chemists and to such general interest that I am compelled to present now its main outlines and present status rather than to wait, as I had intended, until its material results had determined fully its practicability. The scheme was initiated through an article entitled "Temporary Industrial Fellowships" which was published in the *North American Review* for May, 1907. This article was subsequently included as the last chapter in a book called "The Chemistry of Commerce" (Harper's). The scheme as then evolved has developed as I gained experience into something somewhat different; while it is essentially the same, I have found it practicable to claim on behalf of the university more advantages than I at first thought possible. Perhaps the present nature of the scheme is better exemplified in one of the later fellowship agreements, for example in Fellowship No. 7:

For the purpose of promoting the increase of useful knowledge, the University of Kansas accepts from the A. B. C. Glass Company, having head offices at New York, the foundation of a temporary industrial fellowship to be known as the A. B. C. Fellowship.

It is mutually understood and agreed that the conditions governing this fellowship shall be as follows:

The exclusive purpose of this fellowship is an investigation into the optical properties of glass in relation to its chemical constitution, to the furtherance of which the holder shall give his whole time and attention, with the exception of three hours a week, which he shall give to work of instruction in the chemical department.

The fellow shall be appointed by the chancellor of the university, the director of the chemical department and the professor of industrial chemistry; he shall have made previously a reputation in research; he shall be a member of the university, and shall pay all regular fees with the exception of fees for laboratory and supplies, for which his instruction shall be taken in lieu, unless in the opinion of the appointers his demands become excessive, in which case the donor shall be expected to reimburse the university; he shall work under the advice and direction of the professor of industrial chemistry; and he shall forward, periodically, through the professor of industrial chemistry, reports of the progress of his work to the A. B. C. Company.

For the support of this fellowship, which shall extend through a period of two years from the date of appointment of the fellow, the A. B. C. Glass Company agrees to pay fifteen hundred dollars (\$1500) per year, payable annually to the university on the date on which the fellow begins work at the university. This sum shall be paid by the university in monthly installments to the holder of the fellowship.

Any and all discoveries made by the fellow during the tenure of this fellowship shall become the property of the A. B. C. Glass Company, subject, however, to the payment by them to the fellow of ten (10) per cent. of the net profits, to be commuted at the desire of either party through the arbitration provided for herein, arising from such discoveries, it being understood that the fellow shall be regarded as the inventor. At any time during the tenure of his fellowship the holder shall, at the option of the donor, take out patents at the expense of the donor on condition that at the time of making application therefor he shall assign his right to the donor under the conditions of this agreement. At or before the expiration of the fellowship, the business services of the fellow may be secured by the A. B. C. Glass Company for a term of three years on condition that the terms of such services are satisfactory to both parties at interest.

In the event of any disagreement between the donor and holder of this fellowship, it is understood and agreed that the chancellor of the university, or one whom he may appoint, shall act as arbiter as to all matters of fact, that his decisions shall be binding upon the parties at issue, and that they shall obtain such decision before having recourse to the courts.

It is also understood and agreed that during the tenure of this fellowship the holder may publish such results of his investigation as do not, in the opinion of the company, injure its interests, and that on the expiration of the fellowship the holder thereof shall have completed a comprehensive monograph on the subject of his research, containing both what he and others have been able to discover. A copy of the monograph shall be forwarded to the A. B. C. Company, and a copy shall be signed and placed in the archives of the university until the expiration of three years from that date, when the university shall be at liberty to publish it for the use and benefit of the people.

Signed on behalf of the University of Kansas.

Date

Signed on behalf of the A. B. C. Glass Company.

Date

There have been so far accepted by the university the following fellowships:

1. An Investigation into the Chemistry of Laundering, having for its object an improvement which will save in some measure laundered fabrics. It yields \$500 a year, together with 10 per cent. of the net profits.

2. A Search for a New Diastase. The present source of the best diastase is expensive. The investigation has as a matter of fact developed into an attempt to make a new fodder upon scientific principles. It yields \$500 a year and, under the original agreement, 10 per cent. of the gross proceeds for three years.

3. An Attempt to Utilize the Constituents of Waste Buttermilk, which, at present, in butter factories goes down the drains. These constituents, which it is desirable to conserve, are primarily caseine, and secondarily, lactic acid and sugar of milk. The fellowship yields \$500 a year and ten per cent. of the net profits.

4. An Investigation into the Chemistry of Baking. This investigation was established by the National Association of Master Bakers, with the object not only of improving the chemistry of bread, but, as well, of providing for the asso-

ciation a trained expert upon whom they could afterwards rely. It yields \$500 a year, together with a lump sum to be settled by arbitration, if necessary.

5. An Investigation into the Constituents of Crude Petroleum. I can not with propriety state the precise object of this investigation. The fellowship yields \$1,000 a year and 10 per cent. of the net profits.

6. An Attempt to Improve the Enamel upon the Enamel-lined Steel Tanks used in all kinds of chemical operations on a large scale. This fellowship was established by the largest manufacturer of these tanks in the world. It yields \$1,300 a year, together with an additional consideration to be decided upon, for the service rendered, by the chancellor of the university or one whom he may appoint.

7. An Investigation into the Relation between the Optical Properties of Glass and Its Chemical Constitution. This fellowship yields \$1,500 a year and 10 per cent. of the net profits.

8. The Discovery of New Utilities for Portland Cement and of Improvements in Its Manufacture. This fellowship yields \$1,500 a year and a large additional consideration dependent upon success.

The fellows for Fellowships Nos. 7 and 8 have not yet been selected. In addition to the foregoing fellowships there are certain others assured but not yet established:

9. An Investigation into Certain Glands of Deep-sea Mammals. It yields \$1,500 a year and an additional consideration to be decided upon by arbitration. This fellowship is to be a benefaction.

10. The Discovery of New Utilities for Ozone. It yields \$2,000 a year and 10 per cent. of the net profits.

The tenure of all fellowships is two years.

It is regrettable that in accordance with the terms of the agreement, it is impossible to publish at this time the results so far obtained. It may be said, however, that the progress of the fellows has been gratifying. It is significant in this connection that Fellowship No. 1, which expires shortly, is to be continued at *double the value* for three months, at the end of which time the donors will either take the fellow and his process into the factory or they will continue his fellowship through a third year at the increased amount; while with Fellowship No. 2 the donors have already indi-

cated their intention to continue it throughout a third year; the progress of the others has exceeded that of the first two and has surpassed expectations.

Most of these fellowships have arisen through letters of inquiry from the various companies. I have not gone out seeking fellowships in general. Had I done so it is not unreasonable to suppose that by this time there might have been from thirty to fifty. Owing to the fact that these fellowships have no relation to ordinary fellowships and that the scheme is essentially a new one, it has been deemed advisable to establish them at intervals. Proceeding in this way, and learning as one went, the scheme has undergone a natural and advantageous development. The degree to which it has been systematized, its effect upon the chemical department, the results of the relations of the different researches and researchers to one another, and the wholly unexpected interactional relation of the donating companies to one another I shall reserve for a future communication. While it should be said that as yet this scheme of industrial fellowships is wholly experimental and tentative, it ought also to be said that the two years' experience has not shown that it is any other than a sane and practical relation between the university and industry to the advantage of all concerned.

ROBERT KENNEDY DUNCAN

UNIVERSITY OF KANSAS,
April 10, 1909

ELEMENTARY EMBRYOLOGY COURSES

THE publication of Professor Lillie's "Development of the Chick," and the excellent character of his treatment of the subject, suggests comment upon the custom of using the chick for introducing students to embryology. Since the days of von Baer and before, the chick has been used for embryological study more than any other form. This has probably been due in part to its familiarity and to the ease of obtaining embryos of any desired age. Foster and Balfour's very valuable, though poorly written, "Elements of Embryology," based on the chick, for so long the only avail-

able text-book for immature students, fastened more firmly the custom of using the chick in introductory embryological courses. Now comes Lillie's fine treatment of the same subject, which is likely to establish the chick in almost undisputed possession of these courses.

Chick embryos are easy to obtain and easy to manipulate and much has been written about them; they also have decided resemblance to human embryos. Yet in spite of these advantages I can not but feel that chick embryos are peculiarly ill-adapted to the use of students beginning the study of embryology. The embryo chick is a highly specialized form adapted to a very peculiar environment within an egg shell and still further distorted from the general vertebrate type by the presence of the huge yolk mass. These special adaptations are of great interest, but it has been my experience that they assume an undue prominence in the minds of students and prevent their readily grasping the general phenomena of development of vertebrates, unless some less specialized form, as for example, the frog, has first been studied.

The first three years I taught elementary embryology we began with the chick and used it chiefly, if not exclusively. Since then, each year, after a brief consideration of the cell, its organs, and its behavior in mitosis, and a rapid survey of cleavage and gastrulation in half a dozen forms, we have taken up the embryology of the frog, using Marshall's "Vertebrate Embryology," modified and supplemented, of course, by the lectures. The laboratory work has covered the same ground as the classroom work. After completing the study of organology in the frog, two weeks to four have been given to the chick and two or three lectures to comparisons with the development of mammalia.

The point I would like to emphasize is that I have found that the students in these later courses got a far better grasp of the embryology of the chick in two weeks' study following careful work upon the frog, than they ever succeeded in obtaining when they began with the chick and devoted all the time to this subject, and of course they got a far more adequate conception of the embryology of verte-